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<p>(54) Title: <b>CLEANING ARRANGEMENT INCLUDING FILTERS AND ULTRAVIOLET RADIATION</b></p> <p>(57) Abstract</p> <p>The present invention relates to an arrangement in a purifying system, especially purification related to micro particles and micro organisms, comprising a base means (52) carrying filter means (53) and UV radiation sources (54n), and for the purpose of providing a filter having a substantially higher capacity and efficiency as regards the collection of particles, as well as destroying fungus, bacteria and virus, it is according to the invention suggested that said base means (52; 52; 302a, 302b) are equipped with preferably remotely controlled means which upon appropriate signal can bring the base means (7a, 7b; 57a, 57b; 320) to, on the one side, take a completely or partly passive mode for harmless UV covered purification/radiation of air, and, on the other side, take an active mode for especially UV exposed radiation of the objects and room surfaces, and preferably in combination with purification of room air.</p>			

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**CLEANING ARRANGEMENT INCLUDING FILTERS AND ULTRAVIOLET RADIATION**

**Filed of the invention**

5       The present invention relates to an arrangement in a purifying system, especially purification related to micro particles and micro organisms, comprising a base means carrying filter means and UV sources.

**10      Background of the invention**

The requirement for purifying air as regards micro particles and micro organisms is continuously increasing, both in private homes, official buildings, restaurants, 15      hospitals, nutrient manufactures, etc.

**Prior art**

20       It is previously known that ultra violet rays within certain wavelength can destroy all forms of micro organisms as well as making irreversible damage to superior creatures if the intensity and the duration of the radiation is above a certain level.

25       For example, in operating rooms there is used UV radiation for sterilising instruments and furniture, but in such cases said UV sources are too few or positioned in such a way that the radiation does not cover the surfaces or objects in question. There are also previously known 30      water purification systems including UV radiation.

Further, there are known various types of mechanical filters, for example so-called absolute filters having a selectivity degree above 99,9%, but such filters will 35      without frequent exchange and separate sterilisation constitute a hotbed of further development of fungi, bacteria or virus.

It is also previously known to use corona discharge for purifying air, so-called bioclimatics, wherein the air passes a corona discharge for combined purification and sterilisation of the air, as well as a refreshment of the oxygen molecules.

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Discussion of the invention

An object of the present invention is to provide a  
10 arrangement in a purifying system in which the combination of previously known cleaning methods can provide a substantially better result, at the same time as the arrangement in a simple manner can be adapted to various fields of application.

15

This is achieved in an arrangement of the type as stated in the preamble, which according to the invention is characterized in that said base means are equipped with preferably remotely controlled means which upon appropriate signal can bring the base means to, on the one side, take a completely or partly passive mode for harmless UV covered purification/radiation of air, and, on the other side, take an active mode for especially UV exposed radiation of objects and room surfaces, and preferably in combination with purification of room air.

Especially in connection with the utilisation wherein the purification system also is to effect direct UV radiation of the room in question and the objects being housed therein, the invention is characterized in that said base means are constituted by housing means comprising one or more controlled covers which through appropriate signal take a closed position for UV covered purification/radiation of air and an open position for combined UV exposed radiation of objects and room surfaces and purification of air, respectively.

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5 It may be appropriate that said housing means is arranged for ceiling mounting, wall mounting, stand-alone mounting, or a combination thereof, for by the combination of several housing means to render full UV radiation of all surfaces/objects in a room.

10 Alternatively, an embodiment may be to the fact that said preferably remotely controlled means are provided for displacing said arrangement in the room in question.

15 10 In connection with other embodiments one housing means can be provided as a central first aggregate, said aggregate comprising an inlet pipe sucking impure air to the housing means via a plurality of branches included in a ventilation system, for example branches which are designed as ornament objects and/or utility objects in a living room, for example a restaurant.

20 20 A variant of such an aggregate can be to the fact that said aggregate comprises an outlet opening which by over pressure blows out from said aggregate cleaned air from said housing means via a plurality of branches included in a ventilation system, for example via branches designed as ornament objects and/or utility objects in a living room, for example a restaurant.

25 30 By combining such a blowing aggregate and such a sucking aggregate the output air form the second aggregate can be connected to the inlet to the blowing aggregate, possibly in combination with a heat exchanger and a fresh air intake.

35 Further features and advantages in the present invention will appear form the following description taken in connection with the appended drawings, as well as from the appended patent claims.

Brief disclosure of the drawings

Fig. 1 is a side view partly in section of a first embodiment of an arrangement according to the invention.

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Fig. 2 is a section taken along the line II-II in Fig. 1.

Fig. 3 is an end view seen in the direction of the arrows III-III in Fig. 1.

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Fig. 4 is a perspective, schematic view of the main elements which are included in an embodiment similar to that which is illustrated in Fig. 1.

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Fig. 4A illustrates perspectively as seen from the "underside" an embodiment similar to the embodiment illustrated in Fig. 4, comprising controllable covers in open position.

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Fig. 4B illustrates perspectively a possible separate control panel for the embodiment according to Fig. 4A.

Fig. 4C is a side view partly in section through the embodiment illustrated in Fig. 4A.

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Fig. 4D is a section taken along the line IVD-IVD of Fig. 4C, comprising controllable covers in open position.

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Fig. 4E is a front and view of the embodiment according to Fig. 4C.

Fig. 4F illustrates an alternative or possibly built-in control panel of the embodiment according to Fig. 4c.

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Fig. 5 is a simplified view illustrating an embodiment of the arrangement according to the invention in closed position.

Fig. 6 is a schematical perspective view similar to Fig. 5, but illustrates the arrangement in open position.

5 Fig. 6A illustrates perspectively a free-standing mobile embodiment of the invention.

Fig. 6B illustrates a front view partly in longitudinal section of the embodiment according to Fig. 6A.

10 Fig. 6C is a view as seen from above of the embodiment according to Figures 6A , 6B.

15 Fig. 6D illustrates perspectively on a larger scale details of the lower part of the embodiment according to Figures 6A, 6B.

Fig. 7 is a perspective illustration of a further embodiment of the arrangement according to the invention.

20 Fig. 7A illustrates further details in a variant of the embodiment according to Fig. 7.

Fig. 8 illustrates a first application of the embodiment illustrated in Fig. 7.

25 Fig. 8A illustrates an alternative installation similar to Fig. 8.

30 Fig. 9 illustrates a second application for the embodiment illustrated in Fig. 7.

#### Description of embodiments

In the embodiment of an arrangement in a purifying system according to the invention, which is illustrated in Figures 1-4, the arrangement itself is designated by reference numeral 1, and this arrangement comprises a

housing means 2 housing a pre-filter 3, one or more UV radiation sources 4n, one or more fans 5 as well as a post-filter 6, all of which has been combined for purification and radiation of room air in the room, chamber or hall wherein the arrangement is mounted.

Especially in connection with the arrangement according to Figure 1-4, and as more clearly illustrated in Fig. 4, the housing means 2 comprises covers 7a, 7b which by appropriate signal take a closed position for closed purification/radiation of the air 8 being drawn through the housing by means of the fan 5, see especially Figures 1 and 5, and an open position, see especially Figures 4 and 6, for combined UV exposed radiation of room surfaces and objects in the room in question, as well as purification of the room air 8a passing through respectively by the arrangement 1 itself by this position of the covers 7a, 7b.

It is to be understood that the controlled covers 7a, 7b can be connected to driving means of pneumatic, hydraulic, electric or magnetic art, or similar, possibly in combination, and these driving means will come into action for opening said covers 7a, 7b when the room has been detected empty for human beings and animals, such driving means or special closing means being effective for closing purpose upon detection or observation of human beings or animals.

Appropriately, said arrangement can comprise detecting means of IR-type, or similar, for example located at the sides of the housing, as this is illustrated in Fig. 4 by reference numeral 9. Possibly, such IR-detectors 9 can be connected for preventing the opening of said covers 7a, 7b upon observation of human beings and animals.

More specifically the arrangement illustrated in Fig. 1

may comprise a pre-filter 3, for example an EU4-filter preventing direct or reflected UV radiation through the inlet side.

5 Further specifically the arrangement 1 comprises at the inlet end a perforated grate 10 which incoming air 8 must pass before said pre-filter 3, as well as a perforated plate 11 constituting the one mounting wall for the UV sources 4n, which UV sources extend as longitudinal, 10 parallel UV tubes, which at their second end is mounted in a second perforated plate 12. Thereafter, in the air flow direction, said fan 5 follows, as well as the post-filter 6 which preferably can be a bioclimatic filter, i.e. a corona discharge means which the outgoing air 13 15 passes for removal of odour, oxygen renewal as well as possible collection of dust, virus, fungus spores and anything else.

20 The outlet air 13 passes through a filter grid 14 which at the bottom is prolonged to a control plate 15 comprising control lamps, off/on button, means 16 for bioclimatic regulation, as well as hour counter 17 for said UV sources 4n, as well as hour counter 18 for said corona 25 sources 6 for bioclimatic discharge.

As appearing from Figures 1 and 5 said housing means 2 is here sealed and free from direct or indirect radiation from said UV sources, i.e. when it is in operation with said covers 7a, 7b closed, which involves that also human beings and animals can reside in the same room as the arrangement without being unfavourably influenced by the 30 UV sources.

In the housing means 2 there can be provided from one to 35 three fans which are protected by a filter medium which otherwise prevents the radiation of UVC rays.

Fine particles which adheres to the filter will be constantly radiated, such that bacteria and virus on said particles will be destroyed.

5 Lesser particles, from 0,5-0,01  $\mu\text{m}$ , carrying virus and bacteria, will be exposed to a severe UVC radiation in the air flow passing through said housing means 2, said radiation being dimensioned for air velocity up to 4 m/s with 100% sterilisation effect.

10 The housing means can be designed for operation mounted at the ceiling or on a wall, or in any other manner, and can then be operative when people are working in the room because the covers will then be in a closed position.

15 When the room is empty without human beings and animals, said covers 7a, 7b are allowed to be opened and a direct radiation on working surfaces and walls and floor can then be effected, as well as other objects possibly being  
20 in the room, said fans providing circulation of the air 8a, 13a in the room, see specifically Figures 4 and 6.

25 It is to be understood that the pre-filter 3 resides in a chamber which can also give room for all types of filter, including electrostatic filters, which electrostatic filters can possibly be positioned downstreams of the bioclimatic filter.

30 At the outlet portion if said housing means 2, i.e. in the area of the perforated grate 14, there may possibly be provided a carbon filter 6a having its own perforated cover plate, see Fig. 4. This carbon filter 6 can be used alone or in combination with the bioclimatic filter.

35 It is also to be understood that the covers 7a, 7b can appropriately be provided with rubber gaskets and during UV rays.

Further, it is to be understood that the number of covers can be varied from one to several, and also the shape of the covers can be varied within wide limits.

5 In order to achieve radiation in the room wherein said housing means of various types are mounted, such housing means could according to the invention be provided for ceiling mounting, wall mounting, as free-standing units, or a combination thereof, for by such combination of such  
10 housing means to give complete UV radiation of all surfaces in a room, but then when it is observed or registered that no human being or animal are present in the room.

15 By the embodiment as illustrated in Figures 4A-4F, the arrangement itself is designated by reference numeral 51, comprising a housing means 52 including end grates 60, 64 holding a pre-filter 53, for example an EU3 filter a plurality of UV radiation sources 54n, one or more fans 55, as well as a post-filter 56, and also controllable covers  
20 57a, 57b which upon appropriate signal take respectively a closed position, see Figure 4C, for closed purification/radiation of the air 58 which is drawn through said housing means 52 by means of said fans 55, and an open position, see specifically Figures 4A, 4D, 4E for combined UV exposed radiation of room surfaces and objects in the room in question, and simultaneously purification of the room air 63 passing through or by the arrangement 51 itself by open position of said covers  
25 57a, 57b which can be driven by telescope-like arms 57aa, 57bb, for example by means of a vacuum pump (not shown).

30 Also by this embodiment it has been used for example IR detectors 57 located on the side of the housing means 52, which detectors communicate with control means 65, see Fig. 4b, which for example can be arranged separate in relation to the arrangement 51 itself, or communicate

with a second type of control panel 65a which possibly can be built into said arrangement 51 in a suitable manner.

5 It is to be understood that the type of pre-filter and post-filter can be varied within wide limits, and it is also to be understood that the arrangement 51 can comprise electrostatic filters, bioclimatic filters, etc., depending on the conditions prevailing at the place of  
10 use, all of which being arranged for combined purification and radiation of room air at the place of use in question.

15 In Figures 4A and 4D there is illustrated one layer of UV tubes 54n, here for example 10, and such a single layer can appropriately be located so close to the covers 57a, 57b and thereby the opening of the covers as possible, for thereby rendering a best possible and most intense UV  
20 radiation of the room surfaces to be treated. The UV radiation is further improved by the use of full gloss reflectors, for example full gloss Al foils or plates.

25 Further, the number of UV sources may be increased, for example to 3x10 lamps or more, and the air velocity through the arrangement 51 can then be increased from for example 1 m/s to 3 m/s, with just as favourable radiation effect for circulating air through closed arrangement. Alternatively, a UV probe can regulate the air velocity  
30 in dependence of the UV strength.

35 In Figures 6A-6D there is illustrated a free-standing mobile embodiment according to the invention. The arrangement itself is here designated by reference numeral 301, and comprises here an upper portion 302a and a lower portion 302b, wherebetween are extended a plurality of UV radiation sources 304n provided in a ring, and within the ring there is provided a cylinder-shaped com-

5 bination filter, comprising a pre-filter 303, for example an EU3 filter, one or more fans 305 as well as a diffuser 306, all of which being assembled for purification and radiation of room air in the room, chamber on the hall wherein said arrangement 301 is present.

10 In the upper portion 302a there is provided a control panel which can switch on and off the arrangement 301 depending upon whether human beings or animals are within the room wherein the air is to be purified and radiated, said arrangement 301 itself comprising driving means for displacing the arrangement 301 itself to various positions in the room or the chamber, for thereby achieving complete radiation of all exposed surfaces in the 15 room in question.

20 It is to be understood that said means for displacing the arrangement 301 can comprise for example wire pulling means pulling the arrangement 301 along predetermined paths. Alternatively, the arrangement 301 can upon a command be displaced along various types of guiding rails or guiding antennas which appropriately can be provided in the room or in the floor or in walls or ceiling, and be equipped with auxiliary means for raising and lowering 25 the arrangement to the positions rendering effective radiation. The arrangement 301 can also comprise means for robot control alone, for thereby being programmable to an appropriate displacement pattern involving complete radiation of the room within which the arrangement resides, the air at the same time also being purified and 30 radiated when said arrangement is in operation.

35 In the illustrated embodiment there is suggested a lower portion 302b comprising caster wheels 320 attached underneath a plate 321, as well as a superjacent plate 322 on which there may be attached preconnection equipment or ignition coils 323 for said UV tubes, and possibly appro-

priate driving means if the arrangement 301 is to fulfil its program by displacement around the room in question.

5 Said cylindric diffusor 306 can be constituted by a conventional metal pipe, comprising perforations, which involves that the air passing by said pre-filter 303, wherein particles larger than 1,0 µm are trapped, can be scattered along the diffusor/filter 306 and pass the UV tubes 404n arranged at a distance of approximately 25 mm, or possibly less, for thereby imposing an appropriate 10 radiation effect on the microbes and viruses being in the air.

15 By means of the arrangement 301 it is possible in a fast and effective manner to effect radiation of both surfaces and the air in the room wherein the arrangement is residing, for thereby obstructing both airborne and wall settled viruses, also in the size range 0,001 µm.

20 It is to be understood that the upper portion 302a can comprise an IR detector 309 which cuts off possible current supply to the UV lamps 304n when a human being or an animal enters the room in question, and additionally 25 there may be provided a special plug connection 330 which can also be interlocked via IR detector, for thereby achieving double security against damages on human beings or animals due to UV rays.

30 Further, it is to be understood that said control means in the upper portion 302a can be designed so as to comprise a UV probe sensing the output power from said UV tubes 304n, said means regulating the rotational speed of the fan 305 for thereby optimising the air flow throughput through said arrangement 301, and thereby ensure 35 optimum radiation on the detrimental particles to be found in the air.

5 By this mobile or partly mobile arrangement 301 it can thereby be achieved a fast and effective direct radiation with long exposure time of the surfaces to be disinfected, said disinfection of air particles being realised in a safe manner by appropriate air flow throughput and distance between the diffusor 306 and the UV tubes 304n in question.

10 In Fig. 7 there is illustrated a variant of the arrangement 101 wherein the housing means 102 itself comprises an inlet pipe 108 for incoming contaminated air, which air passes through a pre-filter and a crude filter 103, for example of the type 103 or 105, whereafter the air passes a plurality of UV sources 104n, whereafter the UVC 15 radiated air passes a crude filter, for example of the type EU7, here designated by reference numeral 103a, which filter catches particles down to a size of 0.5 µm.

20 Downstreams of the crude filter 103a there is provided a fan chamber including a fan 105 conveying the air further on through a chamber wherein are mounted heating elements 120 for possible heating of cold outdoors air, in which chamber there also may be mounted thermostats or heating probes, which more or less preheated air thereafter 25 passes through an absolute filter 121 catching particles down to 0,001 µm, i.e. close to the size of gas molecules, which mechanical filter may comprise fine-mashed cloth of substantial length.

30 Downstreams of an interspace 122 there is in the housing means 102 provided an electrostatic filter 106a, provided in a container for simple dismantling and possible cleaning by washing, whereafter there follows a bioclimatic filter 106 comprising corona discharge sources having the 35 previously discussed function.

The purified air 113 can then via an appropriate outlet

and with an appropriate over pressure be conveyed to the place intended for its application.

5       In Fig. 8 illustrating a first embodiment for this type of arrangement 101a, the inlet pipe 108a can be adapted so as to suck impure air to the housing means 102a in question via a plurality of branches 130n which are included in a ventilation system, for example in a restaurant or similar. In connection with a restaurant  
10      installation such branches can be designed as ornament objects 131n and/or utility objects matching the interior, it being in the restaurant, communal hall, meeting premises, etc., in question.

15      In Fig. 9 there is illustrated another variant of use of a corresponding arrangement 101b wherein an outlet pipe 113b starts from the housing means 102b in question including purified pressure air which via a plurality of branches 130n is blown out from said housing means 102b, said branches 130n being terminated as ornament objects 131n and/or utility objects in an appropriate living room, meeting premises, etc., and by an appropriate utilisation it is possible to combine the aggregates according to Figures 8 and 9 such that the outdoor air 113a from the first arrangement 101a can be connected to the inlet 113b to the second arrangement 102b, possibly in combination with a heat exchanger and a fresh air inlet.  
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30      In Fig. 7a there is further illustrated details of a variant of the embodiment according to Fig. 7, said variant being provided as an arrangement 201 wherein the housing means 202 itself which is illustrated by a section, comprises an inlet pipe 208 for incoming contaminated air which can pass through a pre-filter or crude filter 203, a plurality of UV sources 204n, a crude filter 203a, whereafter the air is guided through a fan  
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chamber including a fan 205. In the fan chamber there is also provided heating elements 220 whereafter in the direction of flow there is mounted an absolute filter 221.

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Downstreams thereof there is provided an intermediate space 222, and thereafter an electrostatic filter 206a and finally a bioclimatic filter 206 comprising corona discharge sources operating as previously discussed in connection with Fig. 7.

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The purified air can pass via an outlet 213 and with an appropriate over pressure be guided to the place of application, for example as illustrated in Fig. 8a.

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In Fig. 8a purified air 213a, for example air which has been purified through the arrangement 201 in Fig. 7a, can be supplied via appropriately located valves 230n, for example located at floor level in a restaurant or similar. Impure or used air 213aa can be sucked out via a plurality of branches 230nn included in the overall ventilation system, and which can be designed as ornament objects 231n and/or utility objects matching the interior of the premises concerned.

20

The outlet air 213aa can possibly be connected to the arrangement 201 illustrated in Fig. 7a, possibly in combination with heat exchanger and fresh air inlet.

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## PATENT CLAIMS

1. Arrangement in a purifying system, especially purification related to micro particles and micro organisms, comprising a base means carrying filter means and UV sources,  
5 characterized in that said base means (2; 52; 302a, 302b) are equipped with preferably remotely controlled means which upon appropriate signal can bring the base means (7a, 7b; 57a, 57b; 320) to, on the one side, take a completely or partly passive mode for harmless UV covered purification/radiation of air, and, on the other side, take an active mode for especially UV exposed radiation of objects and room surfaces, and preferably in combination with purification of room air.  
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2. Arrangement as claimed in claim 1, characterized in that said base means are constituted by housing means (2) comprising one or more controlled covers (7a, 7b; 57a, 57b) which through appropriate signal take a closed position for UV covered purification/radiation of air and an open position for combined UV exposed radiation of objects and room surfaces and purification of air, respectively.  
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3. Arrangement as claimed in claim 2, characterized in that one or more controlled covers (7a, 7b; 57a, 57b) are connected to driving means of pneumatic, hydraulic, electric or magnetic type, or similar, possibly in combination, and that said driving means are effected for opening said covers (7a, 7b; 57a, 57b) when the room has been detected empty of human beings and animals, and that said driving means or specific closing means will effect closing upon observation/detection of human beings and/or animals.  
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4. Arrangement as claimed in claim 2 or 3,

characterized in said detection means comprises IR detectors or similar, which detectors (9; 59) influence driving means/closing means for closing one or more covers (7a; 7b; 57a, 57b), possibly prevent the opening of same.

5. Arrangement as claimed in claims 2-4, characterized in that the arrangement (1; 51; 101) comprises a housing means (2; 52; 102) which holds a pre-filter (3; 53; 103), UV radiation sources (4n; 54n; 104n), fan (5; 55; 105) and post-filter (6; 56; 106) for purification and radiation of room air.

20      7. Arrangement as claimed in any of the claims 2-5,  
          characterized in that said arrangement in  
sequence comprises in the direction of air flow a per-  
forated grate (10), a pre-filter (3), for example EU4  
filter, possibly including an electro static filter, a  
perforated plate (11), longitudinally extending parallel  
UV tubes (4n), a fan (5), a bioclimatic filter (6), a  
further perforated grate (14), as well as a carbon filter  
(6a) with its own perforated cover plate.

30        8. Arrangement as claimed in any of the claims 2-7,  
          characterized in that said covers (7a,  
          7b) comprise rubber gaskets tolerating UV rays.

35        9. Arrangement as claimed in any of the preceding  
claims,  
characterized in that said housing means  
(2) is arranged for ceiling mounting, wall mounting,

stand-alone mounting, or a combination thereof, for by the combination of several housing means to render full UV radiation of all surfaces/objects in a room.

- 5        10. Arrangement as claimed in claim 1, characterized in that said preferably remotely controlled means (320) are provided for displacing said arrangement (301) in the room in question.
- 10      11. Arrangement as claimed in claim 1 or 10, characterized in that said arrangement is provided for robot operation.
- 15      12. Arrangement as claimed in any of the claims 1, or 10-11, characterized in that said arrangement (301) is provided to be displaced by means of a wire pulling means, possibly by being guided along a magnetic rail or antenna, possibly by means of other appropriate controlling systems, possibly being provided with hoisting/lowering means for optimum positioning in relation to surfaces to be radiated.
- 20      13. Arrangement as claimed in any of the claims 1 or 10-12, characterized in that said arrangement comprises detectors (309) for sensing movement in the room in question, and that said detector or detectors (309) are adapted for switching off said UV tubes (304n) upon detection of movement.
- 25      14. Arrangement as claimed in any of the claims 1 or 10-13, characterized in that said arrangement (301) comprises controlling means for supervising the radiation strength of said UV tubes, as well as regulating means for adapted throughflow velocity of the air.
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15. Arrangement as claimed in any of the claims 1 or 10-  
14,

5 characterized in that said arrangement  
(301) comprises an upper means (302a) and a lower means  
(302b), between said means (302a, 302b) provided UV radi-  
ation sources (304n), a pre-filter (303), a fan (305) as  
well as a diffusor (306) provided inside said UV tubes  
(304n) and communicating with said fan (305) and pre-  
filter (303).

10

16. Arrangements in a purification system, especially  
for purification related to micro particles and micro  
organisms,

15 characterized in that said arrangement  
comprises a housing means (102a) which is arranged as a  
central first aggregate, and that said aggregate com-  
prises a feeding pipe (108a) drawing impure air to said  
housing means (102a) via a plurality of branches (130n)  
included in a ventilation system, for example by means of  
20 branches (103n) included in or being designed as ornament  
means (131n) and/or utility means in a living room, for  
example a restaurant or similar.

25 17. Arrangement as claimed in claim 16,  
characterized in that said housing means  
(102b) is provided as a central second aggregate, and  
that said aggregate comprises and outlet pipe (113b)  
which with overpressure blows out from said aggregate  
purified air from said housing means (102b) via a plura-  
30 lity of branches (130n) included in or being designed as  
ornamental means (131n) and/or utility means in a living  
room, for example a restaurant.

35 18. Arrangement as claimed in claims 16 and 17,  
characterized in that said output air  
(113a) from said first housing means (102a) is connected  
to the input (113b) of said second housing means (102b),

possibly in combination with a heat exchanger and fresh air input.

19. Arrangement as claimed as in any of the claims 16-  
5 18,

characterized in that said first and second aggregate, or said first and second housing means (102a, 102b) comprise preferably the same components, substantially a crude filter, UVC sources, fine filter,  
10 fan, heating element, absolute filter, electrostatic filter, as well as bioclimatic filter.

20. Arrangement as claimed in any of the claims 16-19,  
15 characterized in that said housing means (102) comprises a crude filter (103), for example of type EU3, UVC sources (104n), a fine filter (103a), for example of the type EU7, one or more fans (105), heating elements (120), and absolute filter (121), for example having a degree of removal of 99,997% down to a particle size of 0,001 µm, an electrostatic filter (106a), as well  
20 as a bioclimatic filter (106).

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Fig.1.

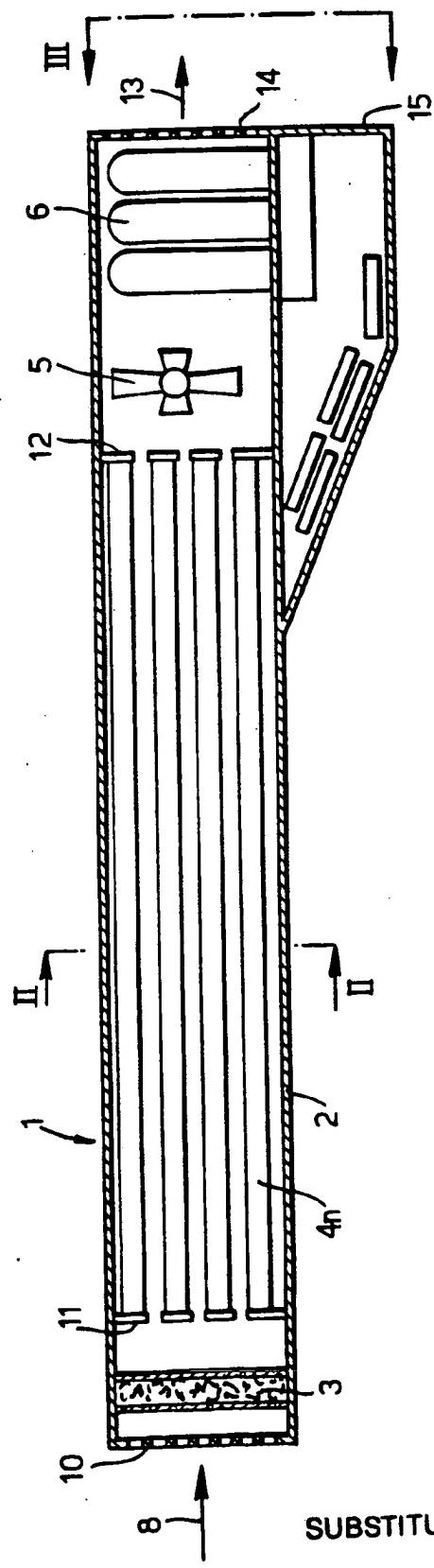


Fig.2.

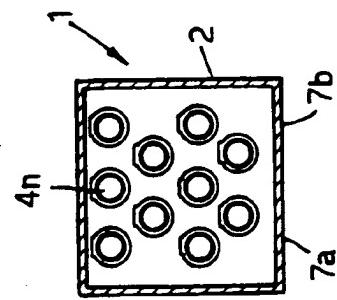
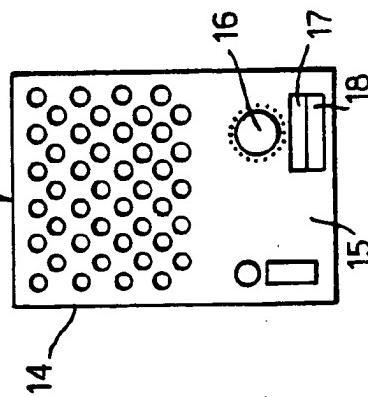


Fig.3.



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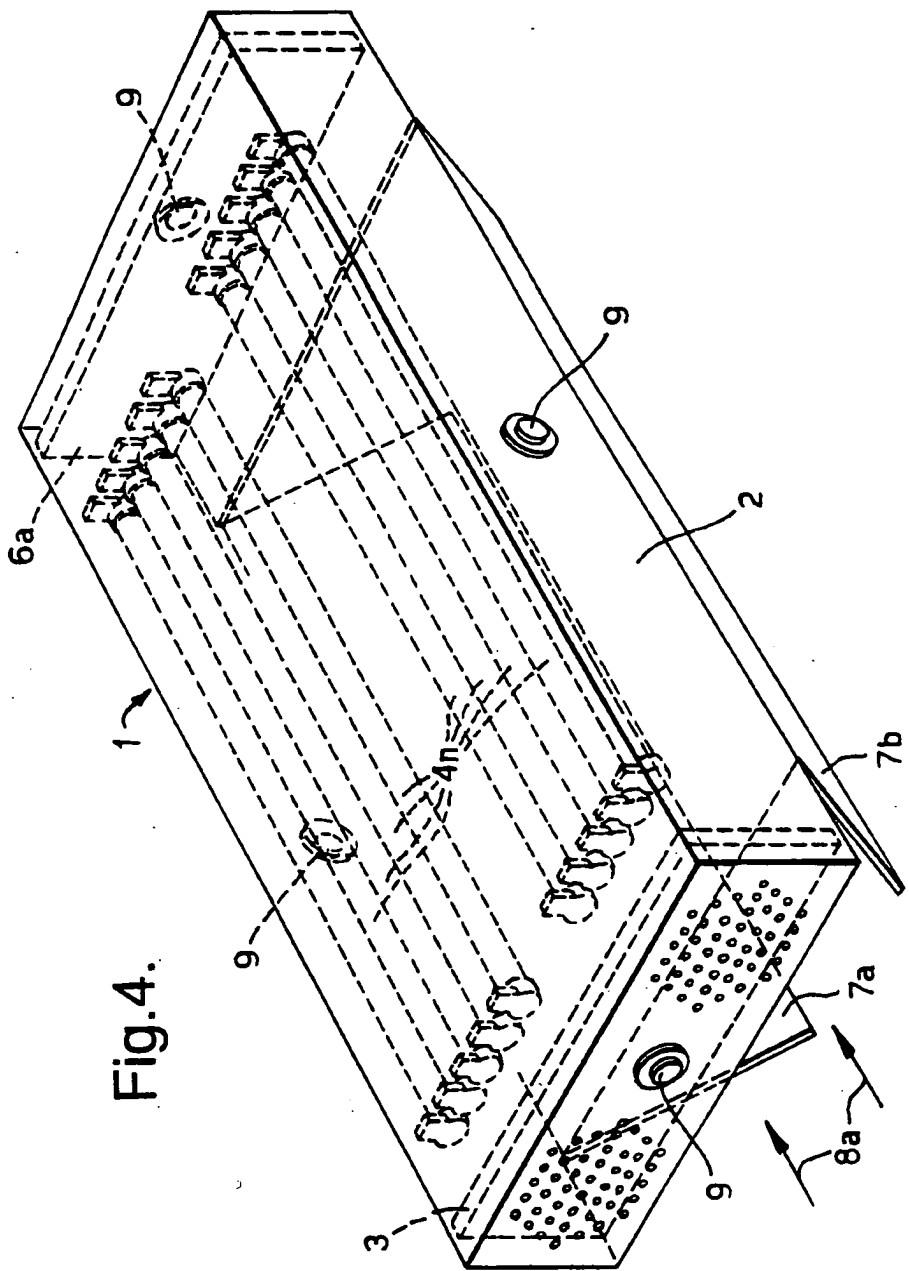
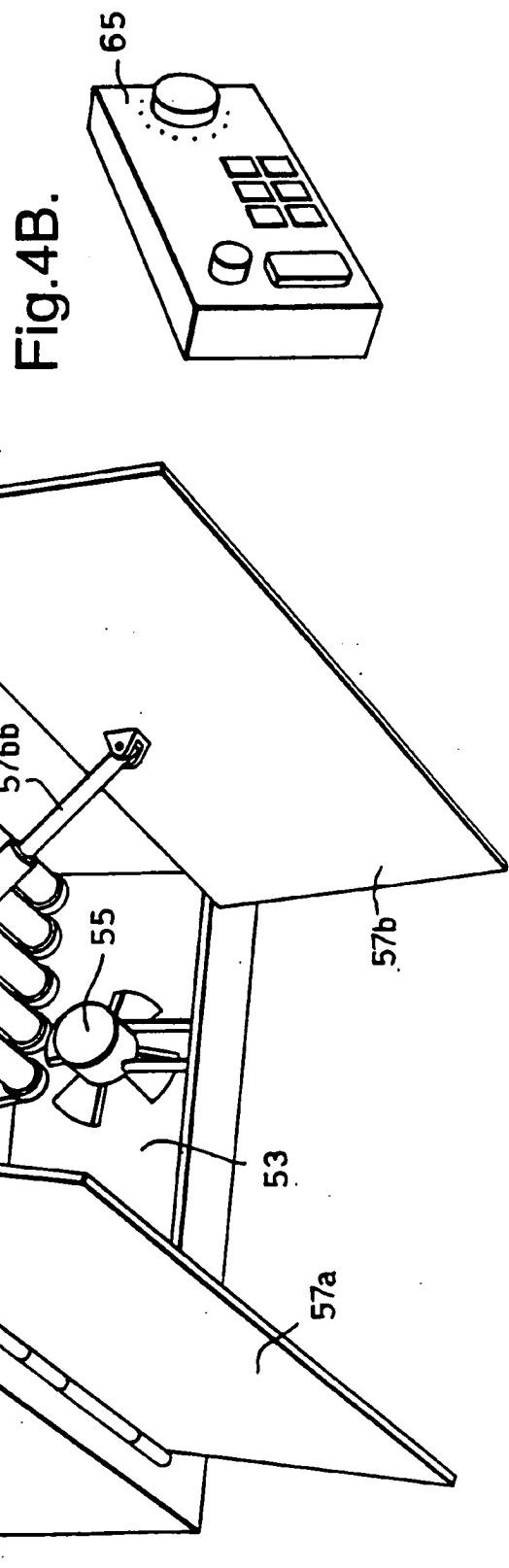


Fig. 4.

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Fig.4C.

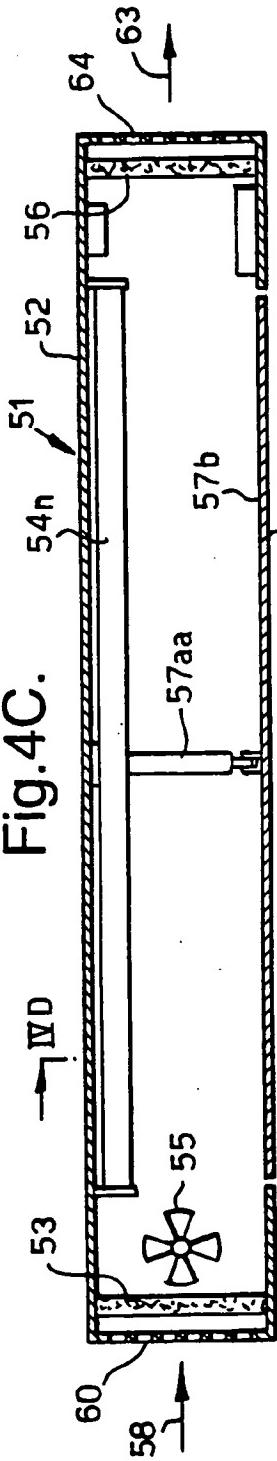
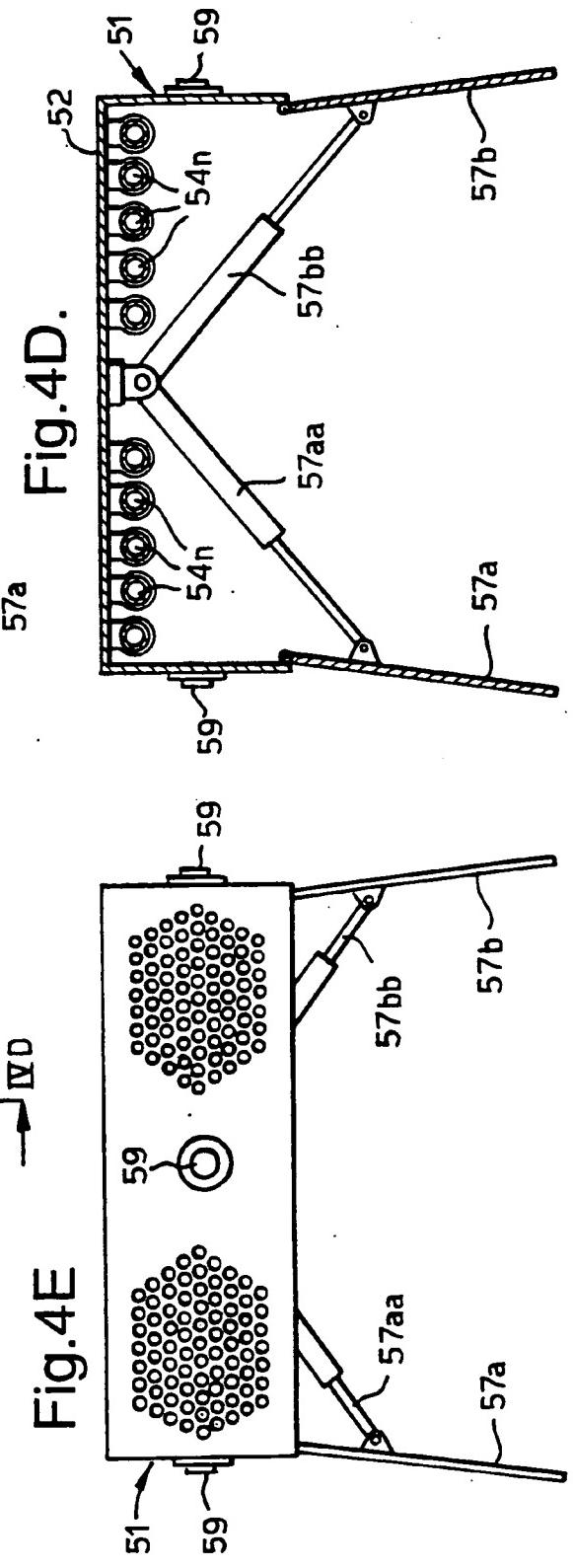


Fig.4E



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Fig.4D.

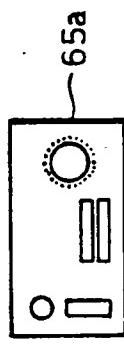


Fig.4F

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Fig.5.

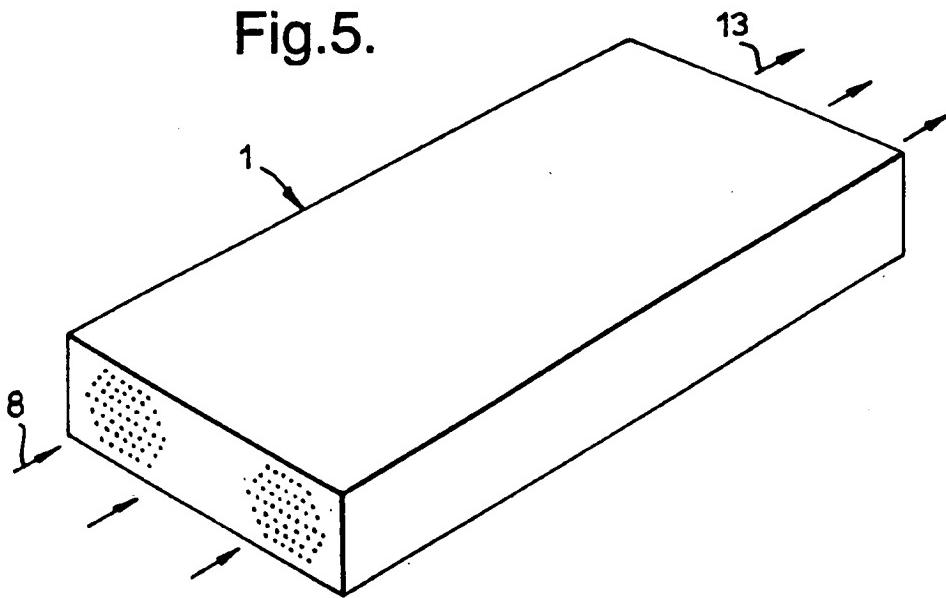
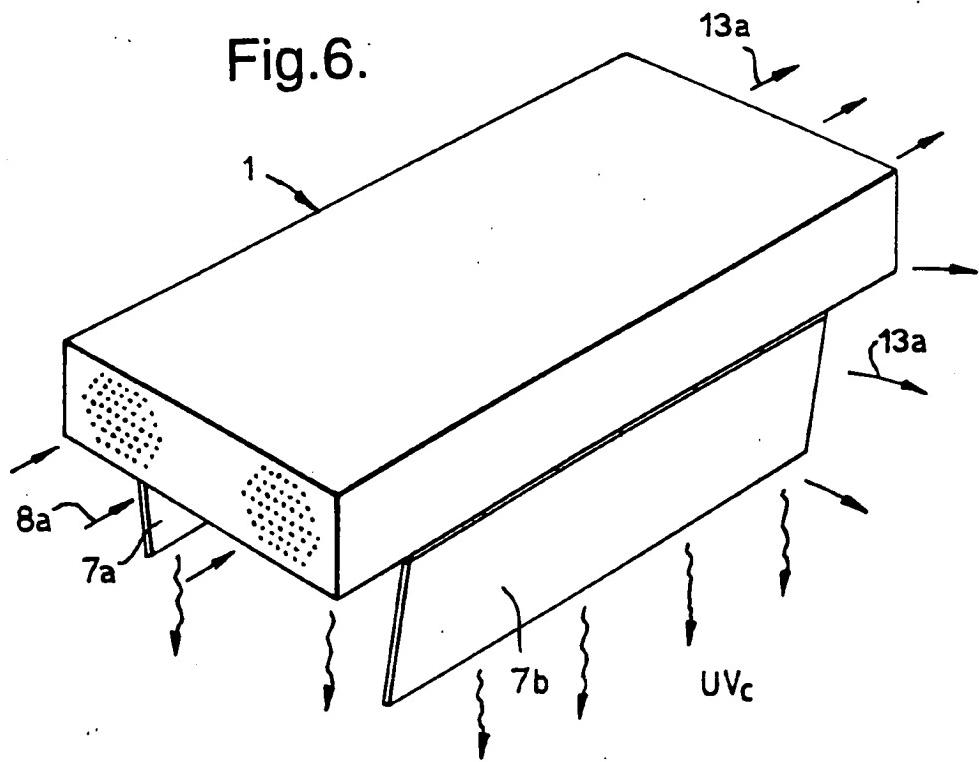


Fig.6.



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Fig.6A.

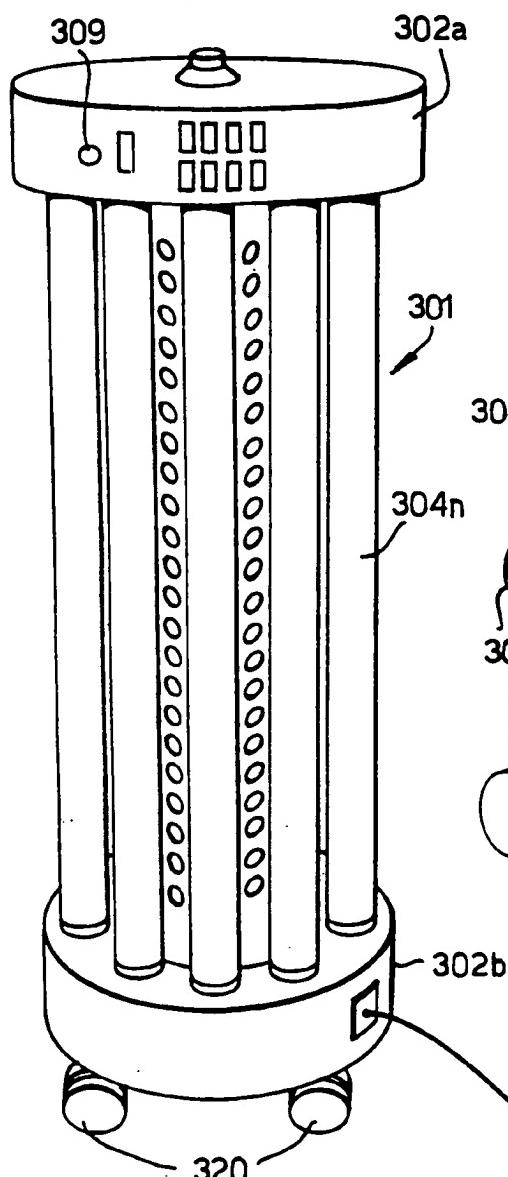
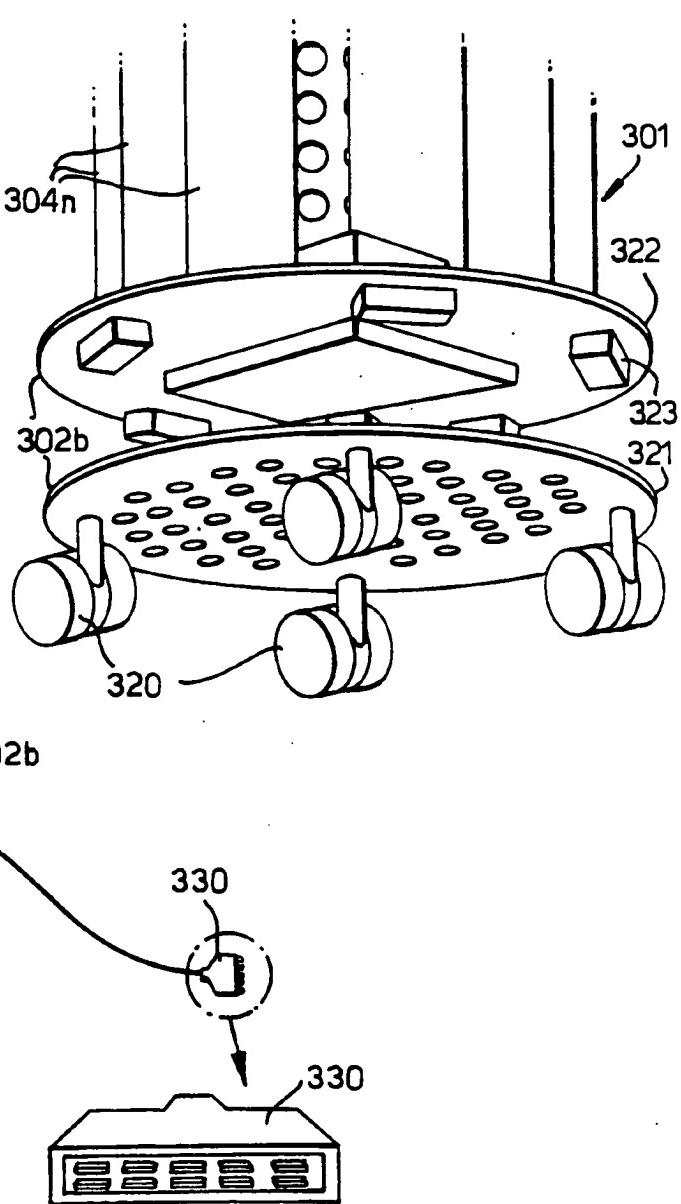


Fig.6D.



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Fig.6B.

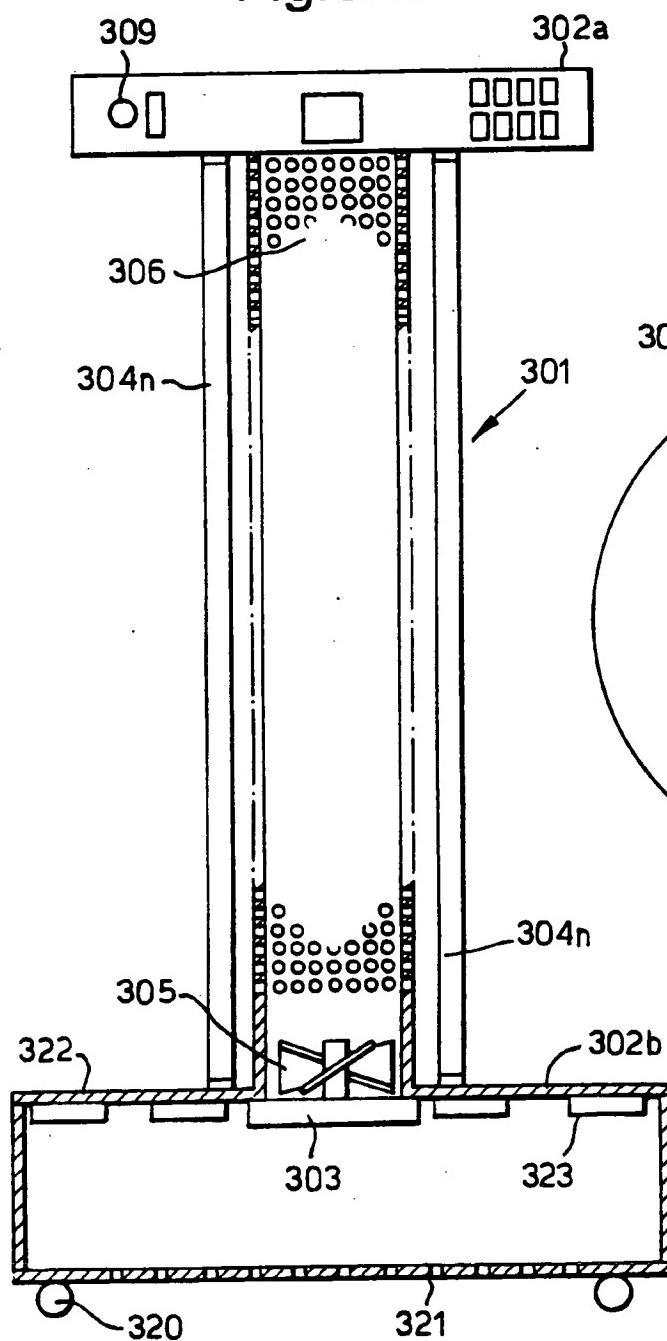
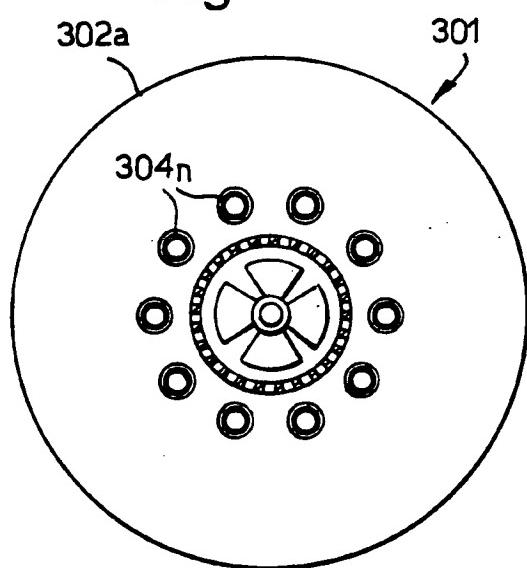
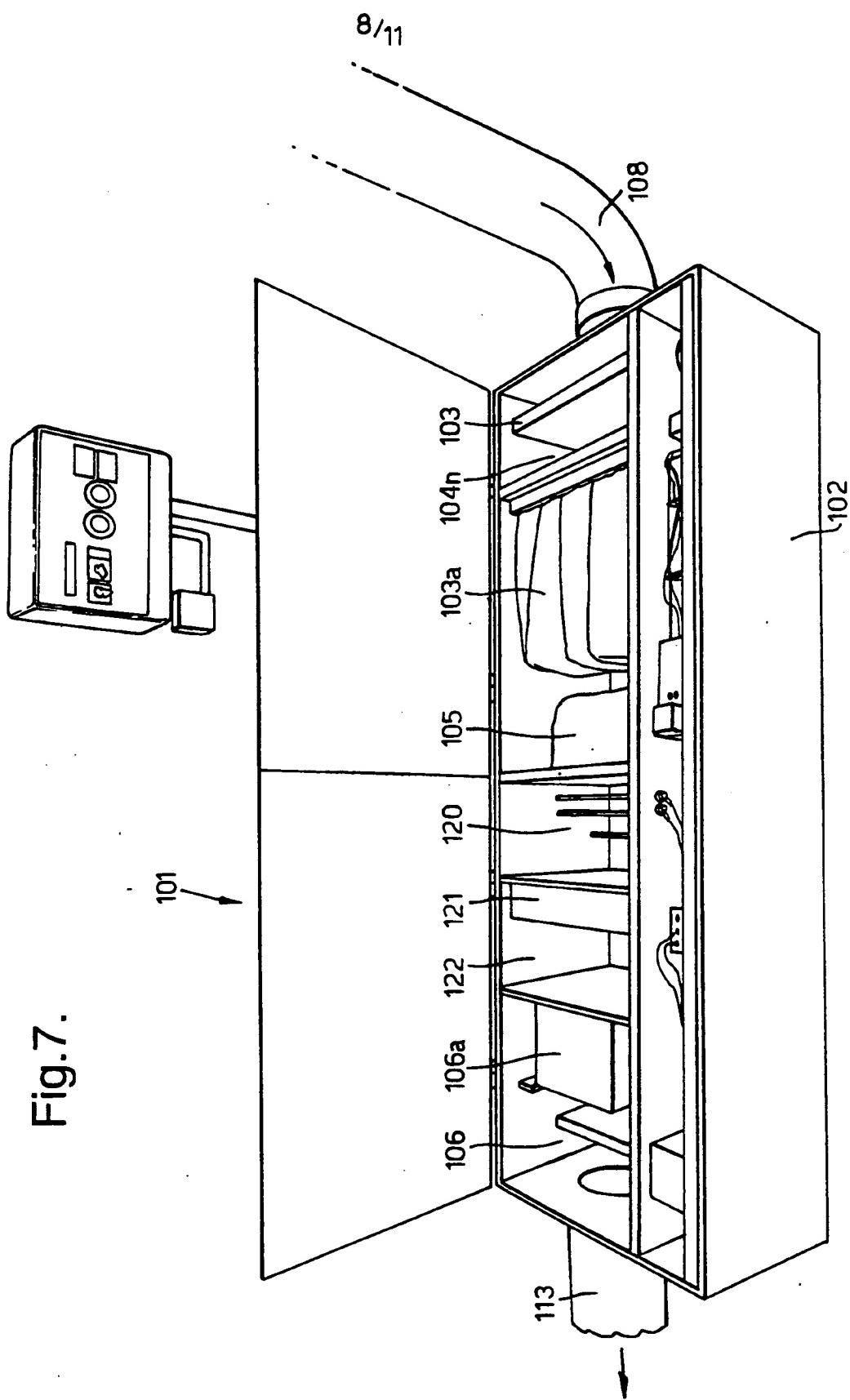


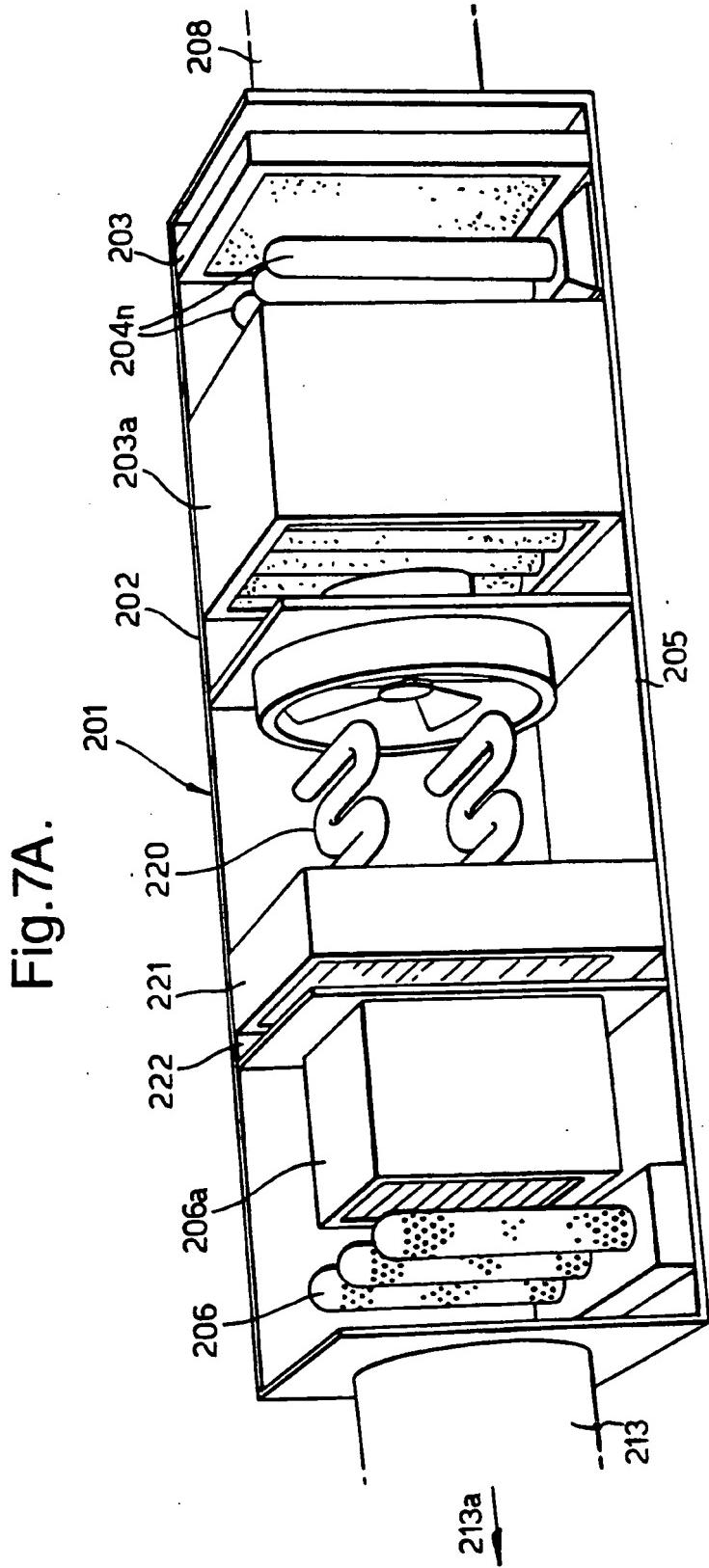
Fig.6C.



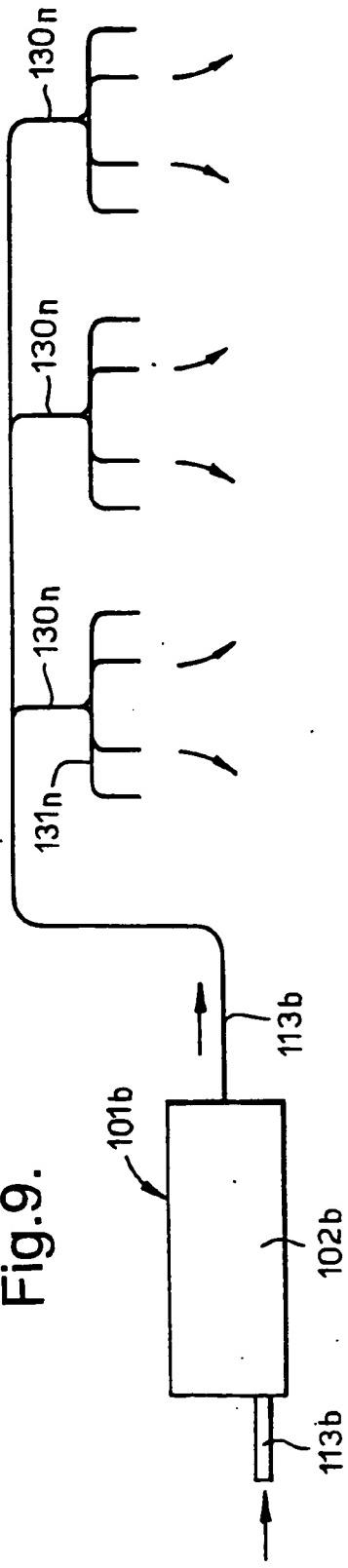
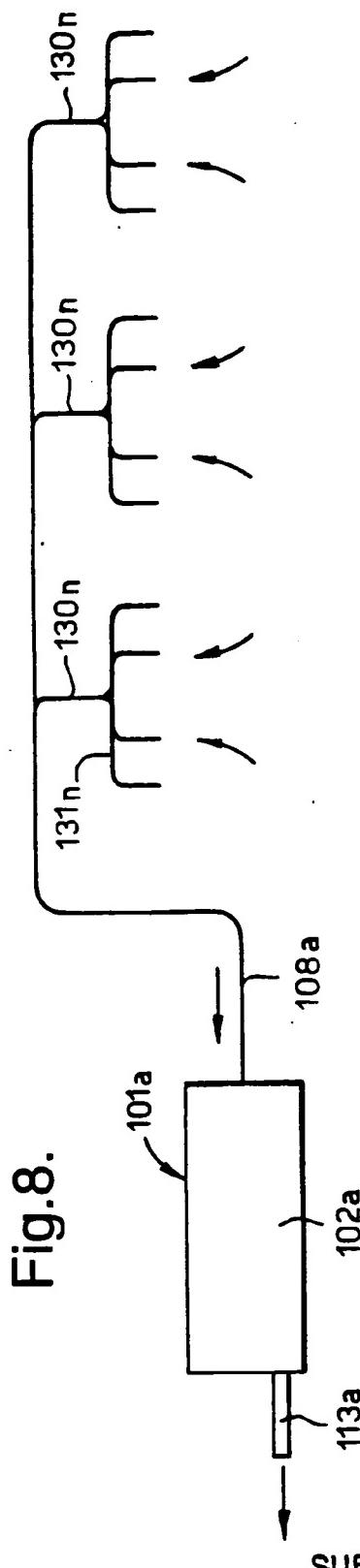


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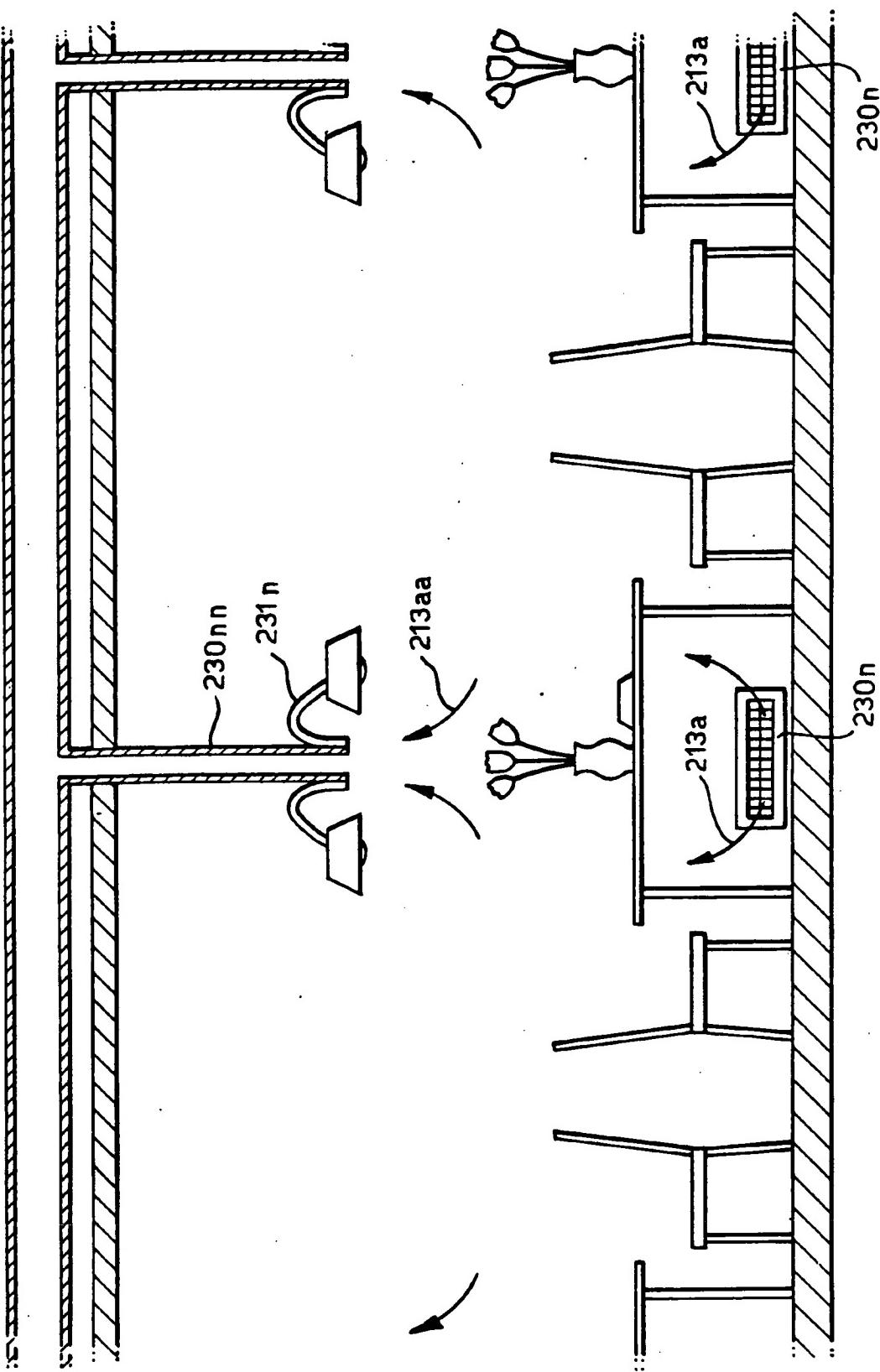
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Fig.8A.



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 94/00194

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F24F 3/16, A61L 9/20, A61L 2/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F24F, A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4766321 (LEW ET AL), 23 August 1988 (23.08.88) --	1,3-20
Y	US, A, 5019804 (FRADEN), 28 May 1991 (28.05.91) --	1,3-20
Y	US, A, 5225167 (WETZEL), 6 July 1993 (06.07.93) --	1,3-20
Y	DE, A1, 3637702 (FUCHS, PETER ET AL), 19 May 1988 (19.05.88) --	1,3-20
Y	US, A, 5114670 (DUFFEY), 19 May 1992 (19.05.92) --	1,3-20

 Further documents are listed in the continuation of Box C. See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"B" earlier document but published on or after the international filing date

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"S" document member of the same patent family

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search

Date of mailing of the international search report

4 April 1995

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## INTERNATIONAL SEARCH REPORT

2

International application No.

PCT/NO 94/00194

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP, A1, 0461310 (GAZZANO, MICHELE), 18 December 1991 (18.12.91) --	1,3-20
A	US, A, 5185015 (SEARLE), 9 February 1993 (09.02.93) --	
A	US, A, 4118191 (BÖHNENSIEKER), 3 October 1978 (03.10.78) --	
A	GB, A, 1421495 (C.A.E.M. -CONSTRUCTION D'APPAREILS ELECTRIQUES ET MECANIQUES S.A.), 21 January 1976 (21.01.76) -----	

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
25/02/95 PCT/NO 94/00194

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A- 4766321	23/08/88	US-A-	4694179	15/09/87
US-A- 5019804	28/05/91	NONE		
US-A- 5225167	06/07/93	DE-T- 550366 DE-D- 69200471 EP-A,A,A 0550366 ES-T- 2048692	31/03/94 00/00/00 07/07/93 01/04/94	
DE-A1- 3637702	19/05/88	NONE		
US-A- 5114670	19/05/92	NONE		
EP-A1- 0461310	18/12/91	DE-D,T- 69011854	12/01/95	
US-A- 5185015	09/02/93	NONE		
US-A- 4118191	03/10/78	CH-A- 614628 DE-A,B,C 2618127 FR-A,B- 2349337 GB-A- 1536397 JP-A- 52131687 SE-A- 7704641	14/12/79 10/11/77 25/11/77 20/12/78 04/11/77 27/10/77	
GB-A- 1421495	21/01/76	AT-B- 324630 BE-A- 800508 CH-A- 568530 DE-A- 2328271 FR-A,B- 2188108 NL-A- 7307812	10/09/75 01/10/73 31/10/75 20/12/73 18/01/74 10/12/73	